Lucina s. s.

(Mollusca : Bivalvia)

in the Western Atlantic:

A Reappraisal

BY

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(2 Plates; 3 Text figures)

THE BIVALVE SUBGENUS *Lucina s. s.* lives throughout the Caribbean and along the coast of the southeastern United States; it occurs also in the fossil record of the region. It is not known, however, in the Eastern Pacific province. Despite its present wide distribution only a single Recent species has been recognised: *Lucina (L.) pensylvanica* (Linnaeus, 1758). It lives in shallow water and prefers a carbonate environment.

In the collections of the Linnean Society of London there are five specimens of *Venus pensylvanicus* Linnaeus, 1758, one of which bears the number 139 (Figures *4, 5*). An accompanying explanatory note by S. P. Dance (1963) reads as follows:

> "*V. pensylvanica* L.
> Syst. Nat., Ed. 10, p. 688 No. 114; Syst. Nat., Ed. 12, p. 1134 No. 138.
> Hanley 1855, Ipsa Linn. Conch., p. 75.
> Dodge 1952. Hist. Rev. Moll. Linn., Pt. 1, p. 110.
> Remarks.—Hanley has isolated five valves one of which is marked 139. As Dodge and Hanley state this is the Ed. 12 number for *Venus incrustata* [Indian Ocean] and that the number was, therefore, an error for 138. On the other hand no specimens have been found in the collection which can be assigned to *V. incrustata.* Hanley says that Linnaeus did not possess *incrustata.*"

Also appended is the comment of Hanley (1855: 75) which ends:

> "The violet edged shell subsequently distinguished as *V. pensylvanica* in the "Museum Ulricae" is, of course, distinct (a *Cyrena*?)."

These statements illustrate some of the problems concerning the identity of the species *pensylvanica* whose locality is given as "America septentrionali." Even the geographical trivial name is cause for suspicion, having little to do with the known distribution which is, according to ABBOTT (1974: 458), "North Carolina to south Florida and the West Indies." It has been reported also, however, from Panamá (Caribbean coast) by OLSSON & MCGINTY (1958: 20) and by RADWIN (1969: 233); from Curaçao by DE JONG & KRISTENSEN (1968: 20) and from the Bahamas by BRETSKY (1976: 322).

Venus is a venerid genus and *pensylvanica,* a lucinid, has been assigned variously to *Lucina, Phacoides* Gray, 1847 (after Blainville, 1825) and *Linga* de Gregorio, 1884. Over the years there has been much discussion and little agreement as to the author of *Lucina:* Bruguière, 1797; Lamarck, 1799, or Lamarck, 1801. The same applies to the related problem of the type-species: *pensylvanica* Linnaeus, 1758; *edentula* Linnaeus, 1758, or *jamaicensis* Lamarck, 1801 (= *pectinata* Gmelin, 1791).

KEEN & ABBOTT (1972: 158) once again review the evidence and conclude that *Lucina* Bruguière can be accepted. They also conclude that, while usage and legal considerations would favour *pensylvanica,* acceptance of *pectinata* as a matter of expediency, would lead to less confusion simply because this was the choice of CHAVAN (in Moore, 1969) in the "Treatise on Invertebrate Paleontology," a work which will be used as a standard reference for a long time to come. In this work, incidentally, *pensylvanica* receives no mention. Accordingly *(loc. cit),* they presented a petition to the International Commission on Zoological Nomenclature (ICZN).

The latest review to be published is that of BRETSKY (1976: 247) which, however, is based on an earlier unpublished thesis (1969) and does not refer to KEEN & ABBOTT (1972). She also reviews the evidence at length and concludes, likewise, that *Lucina* Bruguière and *pensylvanica* are the

validly established genus and type-species, although with some reservations in the case of the latter. Furthermore, she considers the subgenera assigned by CHAVAN (in Moore, 1969) to *Lucina* and *Linga* to constitute a single lineage, the former having priority.

In the interim, REHDER *et al.* (1973: 70) had entered a counter-petition to the ICZN proposing that *Venus pensylvanica* Linnaeus, 1758, should be designated the type-species of *Lucina* Bruguière, 1797. The Commission voted in favour of this counter-petition, a decision which was promulgated in November 1977 (Bull. zool. Nomencl. vol. 34, part 3, p. 150). This placed *Lucina* Bruguière, 1797, on the Official List of Generic Names in Zoology with *Venus pensylvanica* Linnaeus, 1758, as type-species (Opinion 1095).

Had the present study been undertaken earlier, calling in question, as it does, the identity of *pensylvanica,* would the voting have been affected?

Other Recent species of *Lucina s.s.* have been named from the region and BRETSKY (1976: 251) has this to say about them: "Deshayes's *Lucina aurantia* apparently differs from *L. pensylvanica* (Linnaeus) only in possessing internal and external coloration. Since in several other lucinid species, individuals may have or lack color on the shell, *L. aurantia* is here synonymized with *L. pensylvanica.* The name *Lucina virgo* Reeve applies to shells which have been smoothed by post-mortem abrasion (Abbott, 1954). Reeve also proposed that the name *L. grandinata* replace *L. pensylvanica* because he "doubted whether the *Lucina pensylvanica* really inhabits the shores from whence it derives its name"; however, emendations for such reasons have no status in nomenclature." This, then, leaves *pensylvanica* as the only Recent representative of *Lucina s.s.* in the region. Nor does this subgenus occur in the Eastern Pacific where the nearest relative belongs to the subgenus *Here* Gabb, 1866.

In her review of the fossil record of *Lucina s.s.*, BRETSKY (1976: 150) traces its origins back to the Eocene of the southeastern United States and Colombia. She notes that *L. carinifera* Conrad from the Eocene Gosport Sand is essentially identical with *L. pensylvanica,* an indication of the conservative nature of the genus as found in many other bivalve genera. Of particular interest to us, however, are the more immediate ancestors of the Pliocene and Pleistocene. *Lucina pensylvanica* is reported from the Caloosahatchee formation of Florida (DUBAR, 1958: 166; OLSSON & HARBISON, 1953: 80) which is recognised now as early Pleistocene in age (BLACKWELDER, 1981: 24). This species has also been reported from the Pleistocene of Grand Cayman Island by REHDER (1962: 585) and Barbados by DALL (1903: 1368). *Lucina podagrina* (Dall, 1903) comes from the Pliocene Bowden Formation of Jamaica and was said to occur in beds of equivalent age on Curaçao (DALL, 1903: 1365). Later, WOODRING (1925: 119, 120) split the Bowden material into two subspecies, *L. podagrina podagrina* and *L. podagrina alaranta,* and a second species, *L. browni.* From the Miocene Pirabas limestone of Brazil, MAURY (1924: 295) described *L. glomeramen,* a very globose form (D/L > 100%), which she compared to *podagrina.* The only other record from the southern Caribbean is that from Colombia of *L. woodringi* Clark, 1946, from the Eocene of the El Carmen area. Although HUNTER (*in* MacGillvary & Beets 1978: 195) places part, at least, of the El Carmen beds in the Oligocene, it has been pointed out to us by Dr. J. Wyatt Durham *(in litt.)* that Clark's locality is in beds that unquestionably underlie the Oligocene as the associated fauna indicates (CLARK, *in* Clark & Durham, 1946: 6). In our collecting of the Venezuelan Neogene, we have not come across *Lucina s.s.,* so far.

In 1970 we collected in Islas Los Roques, Venezuela, a coralline archipelago, a large number of dead specimens of what we supposed were *Lucina pensylvanica;* they occurred at a depth of 2m on carbonate sand and many retained some periostracum. In 1980 one of us (W.G.S.) had the opportunity to collect at Key Biscayne our first comparative material from Florida; it included 44 worn valves and a live specimen of *L. pensylvanica.* It was found, however, that the periostraca of the two suites, whilst basically similar, differed in detail. In the collections of the British Museum (Natural History) a specimen from Belize labelled *pensylvanica* had a periostracum which differed yet again, and markedly so. Finally, a specimen in the wet collections of the Museum from Grand Cayman Island, also labelled *pensylvanica,* had a periostracum similar to that of the Islas Roques specimens, but of a different colour, confirmation of which was forthcoming in 1981 when we collected a large suite on Grand Cayman Island.

The wide geographical separation of the localities will have been noted. Also to be noted is that the differences in the periostraca are not reflected by immediately obvious differences in the shells themselves. This raises the question of the identity of *pensylvanica* which cannot be related directly to any of these forms because the five "type" specimens are very worn and only one, the smallest, retains an inadequate vestige of periostracum. As a corollary, of course, the tracing of lineages in the absence of morphological differences between the shells proper, presents an insoluble problem. Should these forms indeed be distinguishable only by the periostraca, it may represent a unique case amongst the bivalves. A somewhat analogous case is that of *Modiolus squamosus* Beauperthuy, 1967, for long confused with *Modiolus americanus* (Leach, 1815), although the periostraca are quite distinct; in this case, however, there are minor morphological differences between the shells.

In view of the stated provenance of *Lucina pensylvanica,* the only practical solution seems to be to recognise the form from Florida as representative of the species. This solution is here formally proposed.

Lucina s.s. has a remarkable periostracum, but it has received scant attention, generally being described as, "thin, yellowish." A more detailed account is that of Bretsky (1976: 250) who describes it as, "yellow-brown, thin, covering entire surface of valves; elevated ridges of periostracum, which are superimposed on concentric ribs and sometimes broken up to form dorsally reflected spines, give an impression of coarse surface sculpture." Abbott (1958: 119) is the first to mention that, "The fimbriations on the outside of the valves are calcareous in nature." In their work on periostracal structures Bottjer & Carter (1980: 213) make the following comments: "Within the Veneroida, projecting periostracal structures such as thorns and hairlets are largely or entirely restricted to the Carditacea, Arcticacea, and Glossacea. Among the fossil groups possibly allied with the Carditacea, the Upper Paleozoic Permophoridae may have shown periostracal calcification, based on descriptions of radiating spikes and pustules by Girty (1904), Licharew (1925) and Elias (1957).... Other than the Permophoridae, spike or granule-like periostracal calcification is rare but not entirely absent in the Veneroids. Among the Lucinacea, the modern *Lucina pensylvanica* (Linnaeus) shows aragonitic granules within a moderately thick, laminar periostracum (Carter, pers. obs.), but similar structures have yet to be reported in fossil lucinaceans."

In *Lucina s.s.* the periostracum is composed of two elements; the normal covering of conchiolin, concentrically flanged in this case, and a great number of minute, calcareous plates or spines adhering to the ventral surface or partially embedded in the edges of the flanges. The plates and spines are concave dorsally and the ventral surface is granular. It is the morphology of the flanges, the plates and spines and their mode of attachment which differ in the various forms of *Lucina s.s.*

Stanley (1970: 152) discusses the life habits of *Lucina pensylvanica* which in Florida he found living in shallow, subtidal environments in poorly sorted, carbonate sand beneath *Thalassia* beds. In laboratory experiments he found it to be a slow burrower, penetrating directly downwards and adopting a life orientation unique among the lucinids. He states that, "The animal rotates posteriorily from its burrowing orientation to adopt a position with its anterior region uppermost and its lunule surface approximately horizontal." In the lucinids he found the burrowing action to consist of a rotation of up to 45° about an axis normal to the disc. In the case of *Divaricella quadrisulcata* (Orbigny, 1842) he believes that the divaricate sculpture is an aid to burrowing. He does not discuss the role of the complex periostracum in *L. pensylvanica* which, presumably, provides a stabilizing mechanism by trapping sand. It may also assist in the burrowing action when, in the rotational or rocking movement, which he says does not exceed 15° to 20°, the flexible flanges would collapse on the downward-moving half of the shell and would spread on the upward-moving half to provide anchorage, thus tending to drive the animal down. The periostracum must also prove awkward for predators who, nevertheless, had managed to kill 31 (44%) out of 71 paired specimens from Islas Los Roques, most entries being effected near the ventral margin. However, in the suite of 72 paired specimens from Grand Cayman Island, only 7 (10%) had been perforated successfully, with two failures.

How significant are the differences in the periostraca? All forms live in a coralline environment but not all are confined to subtidal depths beneath *Thalassia* beds, as is said to be the case in *Lucina pensylvanica.* Whatever their respective niches, the fact remains that each has evolved a morphologically different mechanism for burrowing and stabilisation, if these are the main purposes of the periostracum. They thus represent different lineages, herein being given formal recognition as : *Lucina (Lucina) podagrina caymanana* subspec. nov.; *L. (L.) belizana* spec. nov.

The periostracum disintegrates rapidly with wave action and abrasion and, once dried out, is easily damaged by handling. Therefore, all our specimens retaining some periostracum have been treated with a varnish (lacquer solvent/styrofoam).

SYSTEMATIC TREATMENT

Superfamily LUCINACEA Fleming, 1828

Family LUCINIDAE Fleming, 1828

Genus *Lucina* Bruguière, 1797

Subgenus *Lucina s.s.*

Type-species (by S.D., ICZN Opinion 1095, 1977, Bull. zool. Nomencl. vol. 34, part 3, p. 150), *Venus pensylvanica* Linnaeus, 1758.

Lucina (Lucina) pensylvanica (Linnaeus, 1758)

(Figures 1, *4, 5, 6, 7, 13*)

Venus pensylvanicus Linnaeus, 1758, Syst. Nat., Ed. 10, p. 688, No. 114.

Description: Based on a suite from Key Biscayne, Florida. Shell white, thick, strong, almost circular and of medium size. Largest specimen: height 39.0mm, length 40.0mm. Equivalve with variation in the convexity of the shell. Ligament external, sunken, long, opisthodetic. Umbones strongly prosogyrate, curling around the small, pit-like lunule. Pseudo-lunule large, cordate, deeply impressed. Posterior area marked off by a deep umbonal groove which indents the ventral margin. Sculpture of regularly spaced, shallow, concentric grooves separated by low, fine ridges; grooves crowded over the upper disc, wide over the central

disc and narrowing towards the ventral margin. Earliest sculpture marks off a prodissoconch-like area where the concentric ridges are abruptly lower and the grooves between show microscopic, crowded, concentric threads. In the grooves over the disc the radial element in the sculpture sometimes feebly indicated, terminating in the minute denticles crenulating the inner margin. Careful removal of the periostracum reveals that the ridges are narrowly laminate, the laminae projecting ventrally at a low angle to the disc and fractionally overhanging the subsequent groove; thus, viewed across the disc from anterior or posterior margin the sculpture can be said to be broadly imbricate. These laminae no doubt assist in anchoring the periostracum; they are very weak and immediately lost, in nature, upon removal of the periostracum. Several strongly marked growth stages. Posterior adductor scar elliptical, anterior long, narrow and almost parallel to the pallial sinus which is whole. Area from sinus to ventral margin with irregular radial wrinkles. Hinge-plate wide, strong; anterior, and more distant posterior, laterals are single in the right valve and double in the left. Both valves have two cardinals, the anterior bifid in the left valve and the posterior bifid in the right valve. Periostracum produced into high lamellae coincident with the concentric, fine laminae of the shell; colour a very light grey-brown. Adhering ventrally along the lamellae are numerous, flattened, blunt-ended, tapering calcareous spines having a weak convexity towards the ventral margin and having a granular ventral surface. The tips of the spines are level with the edge of the lamellae which is often broken back between spines in a dry specimen to give a pseudo-scalloped effect. The base of the spines is bi-lobed and some rows are bipartite (Figure 1). Towards the umbo the spines are crowded but towards the ventral margin the interspaces are as wide as, or wider than, the spines. The spines are radially aligned and large ones measure approximately: width 0.75 mm, length 1.75 mm. In a dry state the lamellae maintain an erect position, i.e.,normal to the disc.

Discussion: It has already been said that *Lucina pensylvanica* can be distinguished from *L. caymanana*, *L. roquesana* and *L. belizana* by its different periostracum (Figures 1, 2, 3). It may also be smaller than *L. caymanana* and *L. roquesana*

Figure 1

Periostracal lamella of *Lucina pensylvanica* (Linnaeus)

(40mm versus 50mm), but the suite is small; it is usually said to measure from 25mm to 50mm, but it is not known whether the larger measurement refers to true *L. pensylvanica* from the east coast of the United States. In the case of H/L the range in all the taxa lies mainly between 95% and 105% with most being almost circular. For D/L (Tables 1, 2) the convexity is 45% to 74% (average 56%) for *L. pensylvanica;* 46% to 83% (average 59%) for *L. caymanana* and 46% to 79% (average 65%) for *L. roquesana.* Therefore, *L. pensylvanica* may have the least average inflation.

Lucina (Lucina) podagrina podagrina (Dall, 1903)

Lucina pennsylvanica Guppy, 1866, (non Linnaeus), Quart. Journ. Geol. Soc. London, 22: 292. Guppy, 1874, (part, non Linnaeus), Geol. Mag., decade 2, 1: 442, (list).

Phacoides (Here) podagrinus Dall, 1903, Trans. Wagner Free Inst. Sci. Philadelphia, 3(6): 1365, 1366; plt. 50, figs. 12, 13.

Phacoides (Linga) podagrinus podagrinus Dall, 1903. Woodring, 1925, Carnegie Inst. Washington, publ. No. 366: 119, plt. 15, figs. 8 to 11.

Phacoides (Linga) podagrinus alarantus Woodring, 1925, *ibid.*, p. 119, plt. 15, fig. 12.

Phacoides (Linga) browni Woodring, 1925, *ibid.*, p. 120, plt. 16, fig. 1.

Discussion: In placing *Lucina podagrina alaranta* Woodring and *L. browni* Woodring in synonymy, the authors simply accept a greater degree of variation in the shell morphology of *L. podagrina podagrina* (see under Shell Morphology). Considering the similarity in shell morphology between *L. pensylvanica* and *L. podagrina podagrina*, the latter might have been made a subspecies of the former. However, as we see now, this would have been wrong, the differing periostraca indicating that the lineages are distinct.

Explanation of Figures *4* to *12*

Figures *4, 5: Lucina (Lucina) pensylvanica* (Linnaeus, 1758), type numbered "139," a left valve, height 24mm, length 25mm (both approximately). The Linnean Society of London

Figures *6, 7: Lucina (Lucina) pensylvanica* (Linnaeus, 1758), live-taken specimen from Key Biscayne, Florida; external and internal views of left valves; height 35.3mm, length 37.7mm, diameter 9.6mm

Figures *8, 9, 10: Lucina (Lucina) roquesana* spec. nov.; Figures *8, 9,* external and internal views of left valve of holotype, BM(NH) Reg. No. 1980105/1; height 38.4mm, length 40.2mm, diameter 13.3mm; Figure *10,* dorsal view of paratype, BM(NH) Reg. No. 1980105/2. Both specimens from Islas Los Roques, Venezuela

Figures *11, 12: Lucina (Lucina) podagrina caymanana* subspec. nov., internal and external views of left valve of holotype, BM(NH) Reg. No. 1980104, from Grand Cayman Island, Caribbean; height 27.5mm, length 28.0mm, diameter 9.6mm

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Lucina (Lucina) podagrina caymanana Gibson & Gibson, subspec. nov.

(Figures 2, *11, 12, 15*)

Description: One valve faintly pink over the umbo and upper disc, remainder pure white. Shell morphology as for *Lucina pensylvanica* with large specimens reaching 49.0 mm. The concentric lamellae of the pale brown periostracum are neatly scalloped between the attached plates to a level below the base of the plates themselves (Figure 2). The rectangular, white, calcareous plates are embedded to about one-quarter of their height in the outer edge of the scalloped lamellae; they are broader than high, are rather strongly curved, being convex ventrally with a granular ventral surface and measure approximately: width 1.75 mm, height 0.75 mm. The plates are closely packed with only narrow interspaces which hardly widen from umbo to ventral margin; there is a strong radial alineation. Towards the anterior margin the plates become narrower. In a dry state the plates fold flat towards the umbo, trapping sand in the interspaces between successive lamellae.

Figure 2

Periostracal lamella of *Lucina podagrina caymanana* subspec. nov. and *Lucina roquesana* spec. nov.

Holotype: British Museum (Natural History), Reg. No. 1980104/1, a paired specimen; height 27.5 mm; length 28.0 mm; diameter 18.2 mm.

Type locality: North Sound, Grand Cayman Island.

Paratypes: British Museum (Natural History), Reg. No. 1980104/2; USNM 784690; Paleontological Research Institution, Ithaca, No. 29846; Natural History Museum Basel; Universidad Central de Venezuela, Escuela de Geología, UCVG 7060; remainder in the collections of the authors.

Remarks: The holotype, a lone specimen from the wet collections in the British Museum (Natural History), bore the label: *"Lucina pensylvanica* (L.), 2.8 m, *Thalassia* marl, N. Sound 620400, Grand Cayman Island, Leg. L. Hull, 12/9/74, Acc. No. 2270." Paratype material consists of 72 paired specimens, 54 right valves and 51 left valves; it is from the north edge of North Sound behind coral reefs on open sand at 3 m. It was not associated with *Thalassia* beds. A few worn valves were collected on the west coast at 7-Mile Beach. No live specimen was found. Abbott (1958: 119) reports that, "Large live specimens were dredged commonly at 15 stations in the north half of North Sound, in Frank Sound, West Bay, and the east end of Grand Cayman in 6 to 40 feet of water over clear sand and sparse algae.... Some specimens were stained with a rose blush." All these he assigned to *L. pensylvanica.* Other records of *"pensylvanica"* from the greater Antilles are those of McLean (1951: 63:12:10) and Warmke & Abbott (1961: 176) from Puerto Rico; of Nowell-Usticke (1959: 10) from St. Croix and Humfrey (1975: 236) from Jamaica. In McLean's figure the periostracum is that of *L. caymanana,* which it presumably is; it is a larger specimen than any other to hand with a length of 54 mm. Bretsky (1976: plt. 25, fig. 1) illustrates a right valve of *"pensylvanica"* from the Bahamas; again the periostracum is like that of *L. caymanana.*

Comparisons: The structure of the periostracum distinguishes *Lucina caymanana* from *L. pensylvanica* and *L. belizana.* From *L. roquesana* it differs in having a pale brown, rather than pale yellow, periostracum, and it is a less globose form (average convexity 59% versus 65%). The colour of the periostracum might be regarded as of little consequence were it not for the other associated morphological differences in *L. pensylvanica* and *L. belizana,* and the fact that in *L. belizana* it is colourless; it is believed that the colour is significant. *L. p. podagrina* Dall is smaller than *L. podagrina caymanana* (42 mm versus 54 mm) and achieves a greater convexity (D/L 94% and 107% versus 83%). Nevertheless, because of the great variability, there is, presumably, a large degree of overlap between the two taxa. As regards *L. podagrina alaranta* Woodring and *L. browni* Woodring, such forms can be matched in the large suite of *L. caymanana* where they call for no special recognition, being integral components of the suite. The shell colour in *L. caymanana,* when present, is pink whereas in *L. aurantia* Deshayes it is orange; it would be interesting to know the provenance of the latter because the colour difference may be diagnostic.

Lucina (Lucina) roquesana Gibson & Gibson, spec. nov.

(Figures 2, *8, 9, 10, 14*)

Description: Shell morphology as for *Lucina pensylvanica* with large specimens reaching 50 mm. Morphology of periostracum as in *L. podagrina caymanana* (Figure 2).

Holotype: British Museum (Natural History), Reg. No. 1980105/1, a paired specimen; height 38.4 mm, length 40.2 mm, diameter 26.6 mm.

Paratypes: USNM 784691; Paleontological Research Institution, Ithaca, No. 8222; Natural History Museum Basel; British Museum (Natural History), Reg. No. 1980105/2; Universidad Central de Venezuela, Escuela de Geología, UCVG 7061; remainder in the collections of the authors.

Distribution: Venezuela: Islas Los Roques, type locality (71 pairs, 10 singles), where it occurs on white carbonate sand, without *Thalassia*, at a depth of 3 m; Isla Tortuga (22 singles); Islas Los Testigos (4 singles); Tucacas, Falcón State (1 single) and Borburata, Carabobo State (4 singles).

Remarks: The few examples from the Venezuelan mainland at Tucacas and Borburata, both coralline environments, are sub-Recent and no fresh specimens have been found.

Comparisons: *Lucina roquesana* is distinguished from *L. pensylvanica* and *L. belizana* by the structure of its periostracum, and from *L. caymanana* by its greater average inflation (D/L 65% versus 59%; see under Shell Morphology) and its pale yellow, instead of pale brown, periostracum.

Lucina (Lucina) belizana Gibson & Gibson, spec. nov.

(Figures 3, *16, 17, 18*)

Description: Shell morphology as for *L. pensylvanica* but with closer and finer concentric ribs. The conchiolin element of the periostracum consists of delicate, closely packed concentric lamellae, colourless to translucent white, the outer edge deeply serrated to give a fringe of fine, sharp, flexible spines of differing heights, the edges of the spines (in a dry specimen) somewhat inrolled to become hollow dorsally (Figure 3). The calcareous element consists of minute, sub-rectangular, almost transparent plates attached along the ventral surface of the lamellae below the level of the fringe; they abut closely one against the other, their ventral surface is granular and there is essentially one plate for each spine; the width of the plates varies. There is no obvious radial alineation and, in the dry state, the concentric lamellae stand normal to the disc. The shell itself is white.

Figure 3

Periostracal lamella of *Lucina belizana* spec. nov.

Holotype: British Museum (Natural History), Reg. No. 1980103; a paired specimen; height 29.6 mm, length 31.0 mm, diameter 19.2 mm.

Type locality: Lighthouse Reef, Belize.

Remarks: Known from the holotype only. The specimen, in the collections of the British Museum (Natural History), bears the label: "Collected between 21st November and 14th December 1977; 2nd Squadron, 13th Signal Regiment; in weed on sand, depth 4 feet."

Comparisons: *Lucina belizana,* with its delicate, fringed periostracum, cannot be mistaken for any of the other taxa heretofore described. The calcareous plates are invisible to the naked eye and, indeed, are hardly noticeable even under the microscope.

OTHER MATERIAL

A single, worn specimen comes from Isla de Aves lying 500 km to the north of Isla Margarita, Venezuela. From Barbados there are 24 specimens, a few of which retain vestiges of periostracum; it has the pale yellow colour and plates of *Lucina roquesana,* but the neat scallops to be seen in the latter are not evident. From the Bahamas 3 specimens lack any periostracum and, lastly, there is a single example from a Pleistocene reef on Cancun Island, Yucatan (H. Krause *leg.*).

Explanation of Figures *13* to *18*

Figure *13: Lucina (Lucina) pensylvanica* (Linnaeus, 1758), close-up of left valve from Key Biscayne, Florida (Figure *6*)

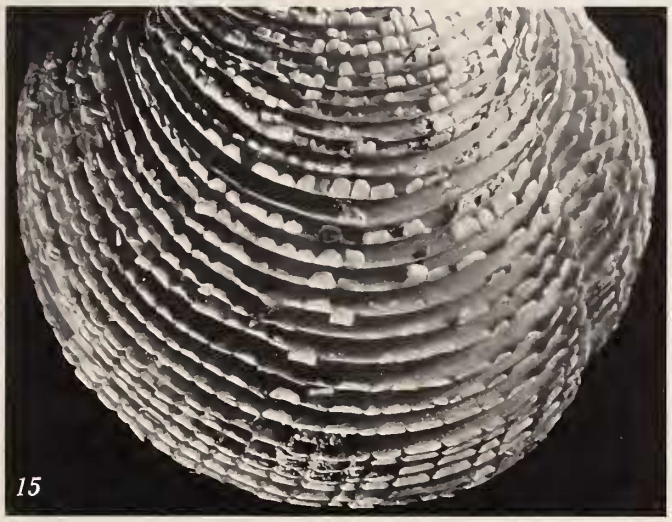
Figure *14: Lucina (Lucina) roquesana* spec. nov., holotype, BM(NH) Reg. No. 1980105/1; close-up of right valve (see figures *8, 9, 10*)

Figure *15: Lucina (Lucina) podagrina caymanana* subspec. nov., holotype, BM(NH) Reg. No. 1980104; close-up of left valve (Figure *11*)

Figures *16, 17, 18: Lucina (Lucina) belizana* spec. nov., holotype, BM-(NH) Reg. No. 1980103, paired specimen from Belize; internal and external views of left-valve and close-up of Figure *17;* height 29.6 mm, length 31.0 mm, diameter 9.6 mm


13


14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